
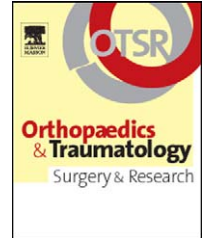




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CLINICAL REPORT

Modified resection technique for proximal fibular osteochondromas

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KEYWORDS

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Summary Osteochondroma is one of the most common tumors arising from the proximal fibula. Surgical treatment of proximal fibula osteochondromas may vary from debulking to resection of proximal fibula. We describe a modified surgical technique for excision of proximal fibular osteochondromas which preserves the proximal tibio-fibular joint (PTFJ). We present a series of six cases of symptomatic proximal fibular osteochondroma. Four cases were solitary osteochondromas while two were a manifestation of a hereditary multiple exostoses. Indication for surgery was peroneal nerve symptoms in three, cosmesis in one, restricted knee motion in one, and pain in one case. All these cases were operated by a modified resection technique where the head of fibula was preserved. The PTFJ was preserved. Lateral stabilizing structures of the knee were left undisturbed, and hence did not need repair. Complications occurred in two patients, one had marginal wound necrosis and one had persistent weakness of extensor hallucis longus. At a minimum follow-up of 2 years, none had recurrence or late disruption of PTFJ.

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Introduction

Fibular tumors comprise 2.5% of total primary bone tumors [1]. The most common tumors of this location are osteochondroma, osteosarcoma, Ewing's sarcoma, giant cell tumor [2]. Eccentric growth of the osteochondromas as a result of solitary osteochondroma or hereditary multiple exostoses may lead to a variety of symptoms. Proximal fibular osteochondromas due to their close vicinity to the neuro

vascular bundle can cause compressive neuropathy of the peroneal nerve [3] or vascular compression syndrome and pseudoaneurysm of popliteal vessels [4]. Depending upon the extent of the growth, surgical treatment of proximal fibular osteochondromas may vary from debulking [5] to resection of proximal fibula [2]. However, after resection of proximal fibula, it is necessary to repair lateral collateral ligament and biceps femoris to prevent lateral laxity of knee.

Here, we describe a new surgical technique for excision of proximal fibular osteochondromas which preserves the proximal tibio-fibular joint (PTFJ), and documents the results of this technique in six cases of symptomatic proximal fibular osteochondromas.

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Table 1 Table showing the details of the patients operated for proximal fibular osteochondromas.

Serial no.	Age (years)/Sex (M/F)	Disease	Indication for surgery	Complication	Follow-up period (years)	Final outcome
1	14/F	Hereditary multiple exostoses	Partial sensory deficit in distribution of sup. Peroneal nerve	Nil	4.5	Complete recovery of the sensory deficit
2	22/F	Solitary osteochondroma	Cosmesis	Nil	4.0	Patient satisfied with final cosmesis
3	18 Yrs/M	Solitary osteochondroma	Sensori-motor deficit TA —4/5 EHL —2/5, EDL —3/5	Persistent weakness of EHL-2/5	3.0	Persistent weakness of EHL, patient ambulant with shoe wear
4	16/M	Solitary osteochondroma	Difficuiltly in squatting secondary to mechanical obstruction	Marginal necrosis of wound	3.0	Regained terminal flexion of knee and the patient is able to squat
5	17/M	Solitary osteochondroma	Sensori-motor deficit TA —4/5 EHL —4/5, EDL —4/5	Nil	2.5	Complete recovery of the sensori-motor deficit
6	19/M	Hereditary multiple exostoses	Pain	Nil	2.0	Patient relieved of pain

F: female; M: male; TA: tibialis anterior; EHL: extensor hallucis longus; EDL: extensor digitorum longus.

Observations

All cases of symptomatic osteochondroma of proximal fibula operated from 2005 to 2008 in our institute were retrospectively evaluated. Nine cases were operated during this period out of which only six were operated by our new technique. In two cases, the osteochondroma was excised with the stalk from fibula while in the other the whole proximal fibula was excised. In the present study, we included only the six cases operated by our new resection technique. All the cases had X-rays and MRI done as part of preoperative evaluation. Indication for surgery was peroneal nerve symptoms in three, cosmesis in one, restricted flexion of knee in one and pain in one patient (Table 1). Pre- and postoperative nerve conduction studies were conducted in relevant cases. All cases were operated by single experienced surgeon. Postoperatively, the patients were immobilized in a cast with knee in 30 degrees flexion to avoid excessive stretch of the peroneal nerve till suture removal. After suture removal, the patients were allowed to bear weight as they were able to, once the pain subsided. In patients who had neurological compromise, an ankle foot orthosis was given till they had recovered back. Follow-up evaluation included clinical evaluation for any wound complications, recurrence, neurological assessment for peroneal nerve, clinical evaluation for varus laxity of the knee and stability of PTFJ. All the six cases completed a minimal follow-up of 2 years.

Surgical technique

All cases were operated under tourniquet in lateral decubitus position. Incision was given starting approximately 8 cm

proximal to the mid point of the popliteal skin crease and extended to the head of the fibula and then straightened and further extended along the line of fibular shaft approximately 5 cm below the planned level of osteotomy. The flaps were raised anteriorly till 2–3 cm lateral to the anterior tibial crest and posteriorly till the midline. Once adequately exposed, common peroneal nerve was explored first. It was easily palpated near the fibular head as it passes around the inferior border of the biceps muscle. The peroneal nerve was approached with the intent of mobilizing the common peroneal nerve and opening and exposing the common peroneal and deep peroneal nerve branch throughout the fibromuscular tunnel as described by Ryan et al. [6]. This was necessary to retract the peroneal nerve safely to a more anterolateral. It is imperative to ensure complete mobilization and release of the narrow part of the peroneal nerve through the fibrous tunnel to prevent postoperative compression on the nerve due to reactive swelling. During this process, it may be essential to sacrifice recurrent genicular branches of the peroneal nerve.

After this, the dissection was proceeded distally at the level of the planned fibular osteotomy. This was calculated from preoperative X-rays taking a free margin of 3–5 cm from the inferior most extent of the stalk of the tumor from fibular shaft. After elevation of periosteum, a transverse osteotomy was done with an oscillating saw. From the level of osteotomy the anterior and lateral compartment muscles were elevated subperiosteally till their origins from the proximal fibula. The dissection stops anteriorly once the interosseous membrane is reached and posteriorly once the aponeurosis separating the peronei from the posterior flexors was reached. To visualize the extent of the osteochondroma, we need to dissect further posteriorly. Lateral gastrocnemius was mobilized and retracted towards

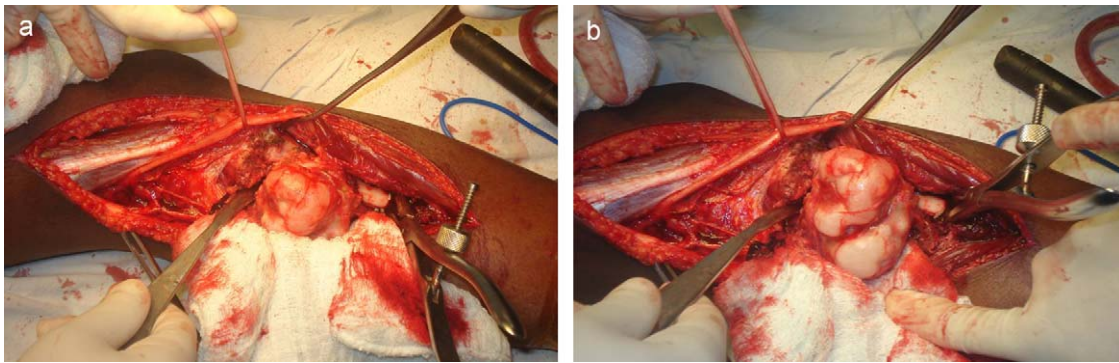


Figure 1 a, b: intra operative photographs showing that internal rotation of the osteotomised fragment delivers the tumor out and exposes the posterior neuro vascular bundle. Note the position of the bone holder and compare the two pictures to appreciate the effect of internal rotation.

midline exposing the soleus proximally and flexor hallucis longus (FHL) distally. Soleus and FHL are released from fibula leaving a cuff of these muscles attached to the fibula (extra periosteal release). No attempt was made to expose the posterior neurovascular bundle.

An osteotomy was done through the head of the fibula at the level of physis in case of immature skeleton or just distal to the PTFJ in case of mature skeleton and this level was confirmed under fluoroscopy. At this time, care was taken not to open the PTFJ, thus leaving the capsule and ligaments of the joint undisturbed. Once this osteotomy was completed, the fibular fragment along with the osteochondromatous growth is free except for the interosseous septum. The osteotomised fibular fragment was held with a bone holder and internally rotated thus exposing the neuro vascular bundle (Fig. 1). The neuro vascular bundle was carefully raised off the interosseous septum and then the interosseous septum was divided delivering out the fibular fragment along with the tumorous growth (Fig. 2). Closure was done under negative suction drain.

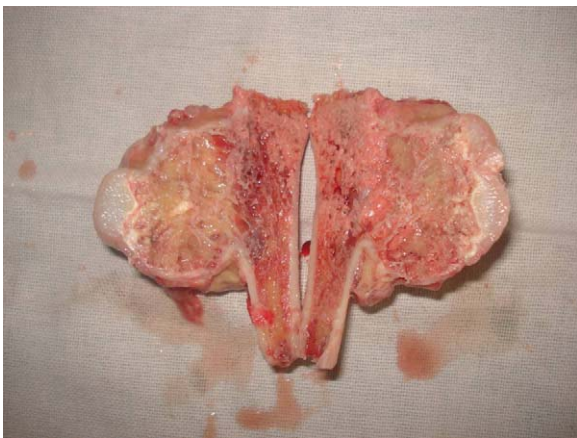


Figure 2 Sagittal cut section of the excised fibular fragment along with osteochondroma. Note the broad stalk of origin which is technically very difficult to approach for simple excision of osteochondroma. Also, note that our proximal osteotomy is planned such that PTFJ is not disrupted.

Results

Six patients were included in our study, of which four were males and two were females. The mean age of presentation was 17.5 years (14–22 years). Four of them had solitary osteochondroma while the other two suffered from hereditary multiple exostoses (HME). In all the cases, the osteochondromatous growth was predominantly posterolateral to posterior. Two of the three patients who had peroneal nerve symptoms completely recovered by 3 and 4 months respectively, while one patient had persistent loss of power in Extensor hallucis longus (EHL) even at final follow-up. Marginal wound necrosis occurred in one patient; however it healed after revision of the margins by 4 weeks.

Follow-up visits revealed that none had recurrence of the tumor. At final follow-up of 2 years, none had lateral laxity of the knee or instability of PTFJ on clinical examination and X-rays revealed the maintained position of the fibular head in its normal anatomy (Fig. 3). All the patients had painless normal gait. The one patient with EHL weakness was offered a surgery, but the patient declined and was comfortably ambulating with shoe wear.

Discussion

Surgery for proximal fibular osteochondromas vary from simple debulking to complete excision of proximal fibula (Malawer type I resection) [2]. Many a time, it is virtually impossible to approach the stalk of the osteochondromatous growth and thus requires excision of the whole proximal fibula [2,7]. Our technique is justified in a way that it preserves the PTFJ and at the same time, the whole osteochondromatous growth is removed en masse with shaft of fibula. We did not feel that the arthrodesis of the PTFJ is essential because that adds to the surgical time, and in our technique, the PTFJ is not opened and hence the anterior and posterior ligaments along with the joint capsule were left untouched. This is supported by our results also that none of the patients had late disruption of PTFJ. Our technique also differs from conventional malawer type I proximal fibular resection [2] that most of the dissection is subperiosteal as we customized the technique for osteochondromas. Malawer type



Figure 3 Three year follow-up X-rays showing AP and lateral views of the patient in Fig. 1. Note that the PTFJ is intact and there is no recurrence of the growth.

I resection is recommended for aggressive benign lesions like giant cell tumor, where entire dissection is extra periosteal and hence removes a cuff of muscles along with fibula. However in our technique, because of subperiosteal approach, most of the aponeurotic origin of the anterior and lateral compartment musculature is preserved.

The main strengths of our study are successful description of a new surgical technique which is easier and does not need to repair the lateral ligaments of the knee, which is supported by results of fairly decent follow-up period of 2 years. However, the drawbacks are a small series and lack of objective evidence of a case control study.

Malawer in his series of 10 aggressive to malignant lesions of proximal fibula described one case of osteochondroma where the whole proximal fibula is excised [2]. Gray et al., described two cases of osteochondroma splitting the peroneal nerve, where one was managed by excision of the osteochondroma while in other, they performed excision of whole proximal fibula [7]. Lindeque et al. described a posterior approach to excise a postero medial osteochondroma of proximal fibula [8]. Krieg et al. reported a case of extensive growth of osteochondroma in a skeletally mature patient where they performed a marginal excision by deflecting the fibular head proximally after an osteotomy and did an arthrodesis of the PTFJ [9]. The anatomy, clinical and functional importance of the PTFJ, seems to be neglected in the literature. The proximal fibula, serving as the point of insertion of the biceps femoris, plays an integral role in the lateral stabilization of knee and excision of the proximal fibula may disrupt lateral stability. It is essential to repair lateral collateral ligament and biceps femoris after proximal fibu-

lar excision [2]. Draganich et al. evaluated six patients of proximal fibular resection where repair of the lateral collateral ligament and biceps femoris was done. They evaluated gait and knee stability with an instrumented system. They concluded that there were significant differences between the side on which an operation had been done and the contralateral side [10]. Hence, in benign conditions like osteochondroma, it is preferred to salvage the PTFJ.

Hence, we conclude that proximal fibula is a common site for symptomatic osteochondromas and here, we describe a new surgical technique for excision of proximal fibular osteochondromas which is more biological and preserves the PTFJ.

Disclosure of interest

The authors declare they have no conflicts of interest concerning this article.

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